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LUMINARY Memo #64

To: Distribution  
From: J. Kernan  
Date: 4 February 1969  
Subject: Verb 85 - RR Antenna Line-of-Sight Display

References: 1) PCR 99.2, DSKY Display of RR Position in Mode II  
2) Section 5 of R-567

Verb 85 is a routine through which the astronaut can monitor the position of the RR antenna in an azimuth-elevation system as shown in Figure 1.

The azimuth is defined as the angle between the X-Z nav base plane and the RR antenna line-of-sight. The angle changes from 0 to +90 as the LOS moves from the X-Z plane toward  $+Y_{NB}$  and from 0 (360) to +270 as the LOS moves from the X-Z plane toward  $-Y_{NB}$ .

The elevation is defined as the angle between the  $+Z_{NB}$  axis and the projection of the LOS in the X-Z plane. The angle changes from 0 toward 360 as the LOS projection rotates positively (right hand rule) about  $+Y_{NB}$ .

As can readily be seen from Figure 1, a more expressive set of names for these angles would be latitude and longitude rather than azimuth and elevation.

When the RR antenna is in mode 1, the angles computed and displayed by this routine are equivalent to the trunnion and shaft CDU values which can be monitored via V16N72.

The value of the elevation angle is indeterminate when the LOS is coincident with either +Y or -Y. Only the +Y orientation is physically possible and there the elevation angle displayed by this routine is +90.

# RR ANTENNA LINE OF SIGHT AZIMUTH AND ELEVATION SYSTEM

FIGURE 1

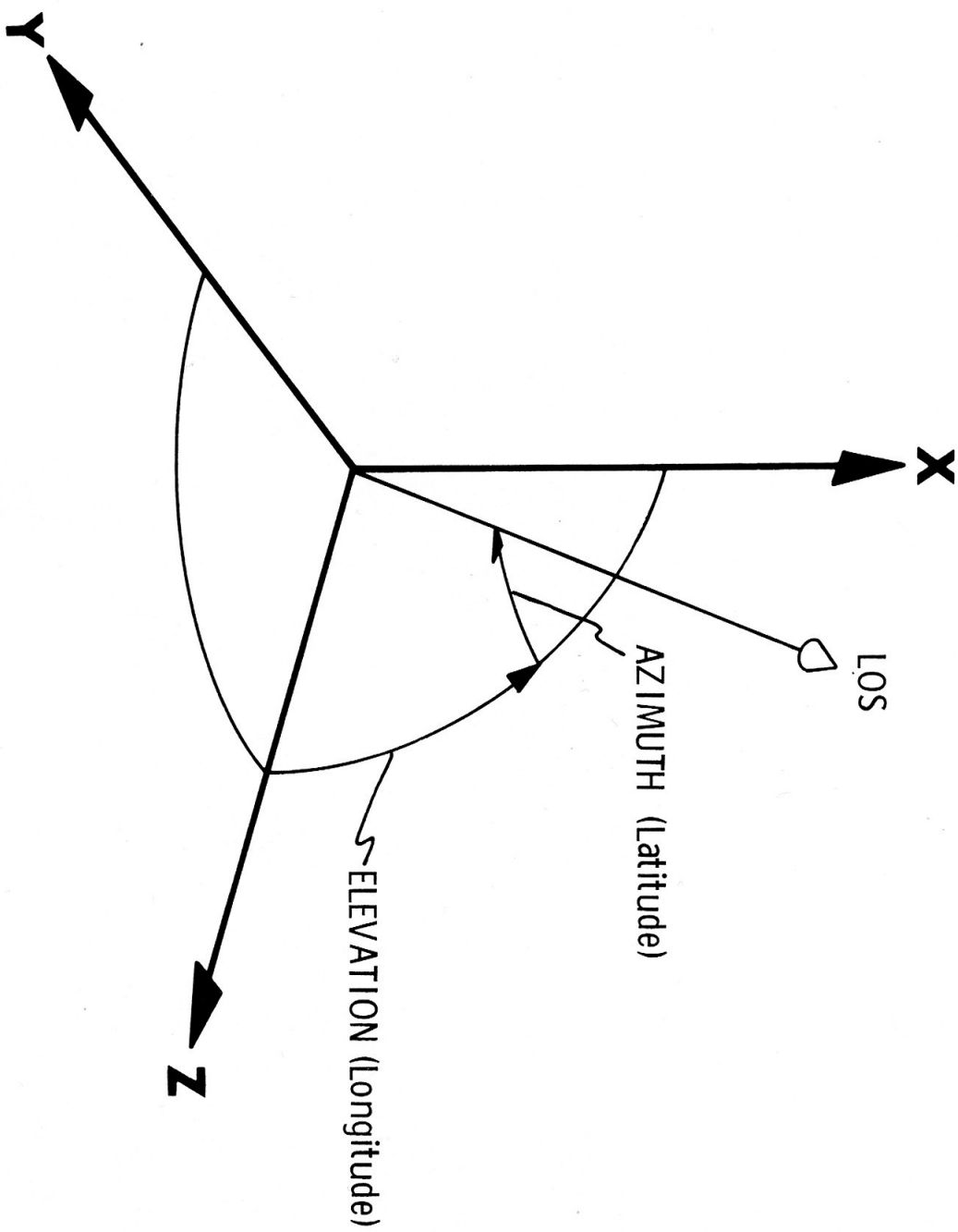


FIGURE 2

## RR AZIMUTH AND ELEVATION COMPUTATION

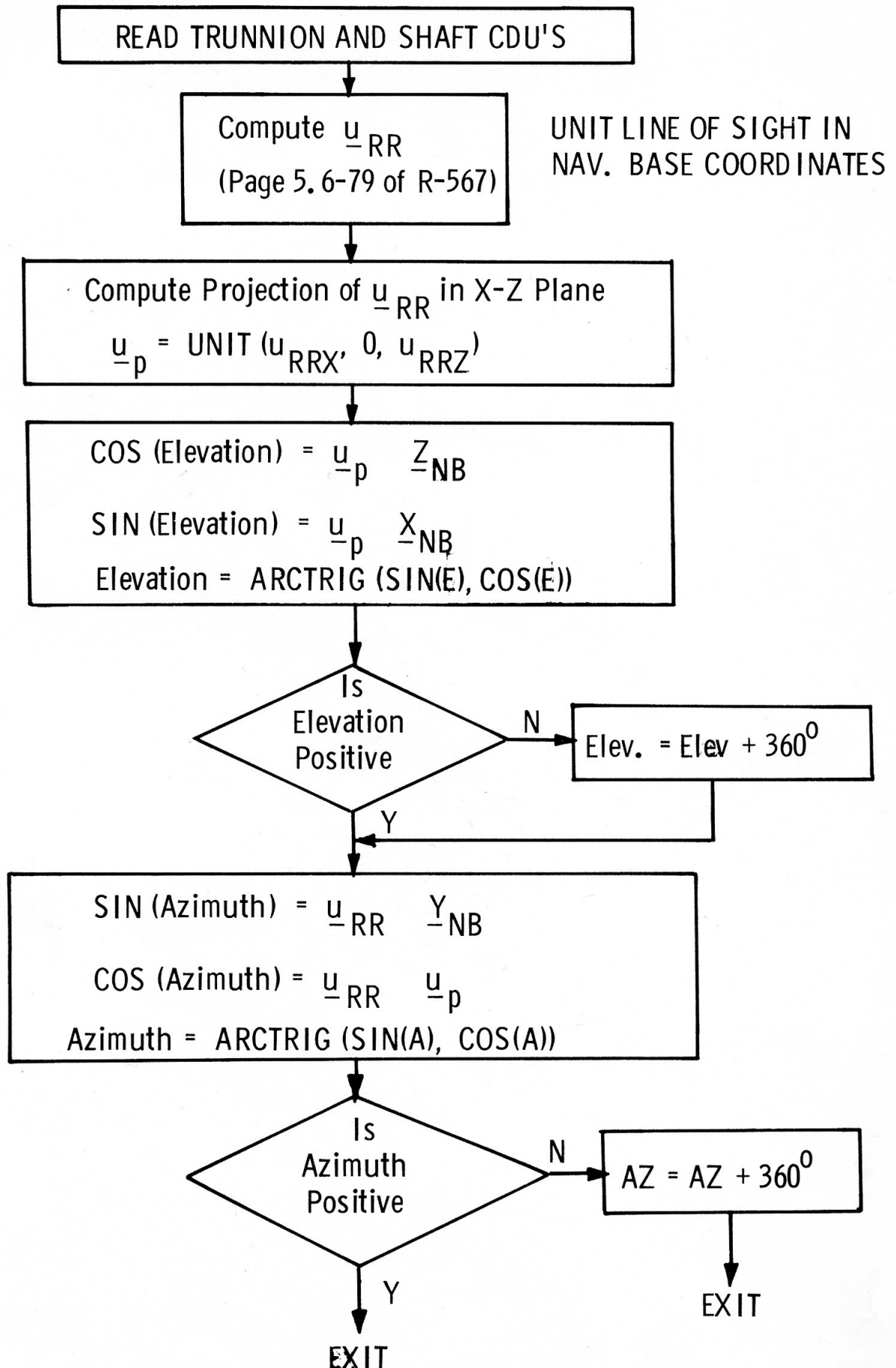


TABLE 1 V85 TEST RESULTS

MODE	CDU VALUES (N72) DEG.	V85 VALUES (N56) DEG.
1	T = +000.00 S = +000.00	A = +000.00 E = +000.00
	T = +010.00 S = +350.00	A = +010.00 E = +350.00
	T = +350.00 S = +010.00	A = +350.00 E = +010.00
	T = +050.00 S = +310.00	A = +050.00 E = +310.00
	T = +310.00 S = +050.00	A = +310.00 E = +050.00
2	T = +180.00 S = +270.00	A = +000.00 E = +090.00
	T = +190.00 S = +260.00	A = +350.00 E = +080.00
	T = +170.00 S = +280.00	A = +010.00 E = +100.00
	T = +230.00 S = +221.00	A = +310.00 E = +041.00
	T = +130.00 S = +320.00	A = +050.00 E = +140.00
LOS = + Y	T = +090.00 S = +000.00	A = +090.00 E = +090.00
LOS = - Y	T = +270.00 S = +000.00	A = +270.00 E = +090.00